Commonwealth of Massachusetts
Executive Office of Energy & Environmental Affairs

Department of Environmental Protection

One Winter Street Boston, MA 02108 • 617-292-5500

Charles D. Baker
Governor

Karyn E. Polito
Lieutenant Governor

Matthew A. Beaton
Secretary

Martin Suuberg
Commissioner

March 7, 2018

Southport on Cape Cod Development LLC
c/o Charles Katz CPA
Attn: Eric A. Katz, Manager
410 Boston Post Rd, Suite 28
Sudbury, MA 01776

Town: Mashpee
WMA Permit #: Permit 9P4-4-22-172.04
Program: Water Management Act
Action: DRAFT Permit

Dear Mr. Katz:

Please find the following attached:

- DRAFT Findings of Fact in Support of the issuance of Permit #9P4-4-22-172.04; and
- DRAFT Water Management Act Permit #9P4-4-22-172.04 for Southport on Cape Cod Development LLC.

Consistent with 310 CMR 36.27(6) - (8) of the revised Water Management Act Regulations promulgated on November 7, 2014, the Department will now publish notice in the Environmental Monitor that a DRAFT Permit is available for review and comment for 30 days following the January 10, 2018 publication in the Environmental Monitor. Notice of the public comment period will also be sent to all registrants, permittees and those having non-consumptive use statements within the Cape Cod Basin. The Department expects to issue the final permit within 30 days of the close of the public comment period.

If you have any questions concerning this letter, please contact Julie Butler at (617) 292-5552 or Julie.Butler@state.ma.us.

Sincerely,

Rebecca Weidman

Rebecca Weidman
Division of Watershed Management
Bureau of Water Resources

eCC: Blake Martin, Weston & Sampson Engineering
Robert Almy, Weston & Sampson Engineering

Todd Richards, MassDFG Division of Fisheries and Wildlife
Steve Hurley, MassDFG Division of Fisheries and Wildlife
Andrew McManus, Mashpee Conservation Commission
Tom Cambareri, Cape Cod Commission

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Massachusetts Department of Environmental Protection
One Winter Street, Boston MA 02108 • Phone: 617-292-5751

Communication For Non-English Speaking Parties

310 CMR 1.03(5)(a)

1 English:
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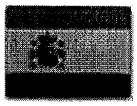

2 Español (Spanish):
Este documento es importante y debe ser traducido inmediatamente. Si necesita este documento traducido, por favor póngase en contacto con el Director de Diversidad MassDEP a los números de teléfono que aparecen más abajo.

3 Português (Portuguese):
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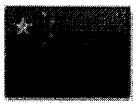


4(a) 中國（傳統）(Chinese (Traditional):
本文件非常重要，應立即翻譯。如果您需要翻譯這份文件，請用下面列出的電話號碼與MassDEP的多樣性總監聯繫。

4(b) 中国（简体中文）(Chinese (Simplified):
本文件非常重要，应立即翻译。如果您需要翻译这份文件，请用下面列出的电话号码与MassDEP的多样性总监联系。

5 Ayisyen (franse kreyòl) (Haitian) (French Creole):
Dokiman sa-a se yon bagay enpòtan epi yo ta dwe tradui imedyatman. Si ou bezwen dokiman sa a tradui, tanpri kontakte Divèsite Direktè MassDEP a nan nimewo telefòn ki nan lis pi ba a.

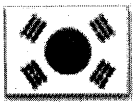
6 Việt (Vietnamese):
Tài liệu này là rất quan trọng và cần được dịch ngay lập tức. Nếu bạn cần dịch tài liệu này, xin vui lòng liên hệ với Giám đốc MassDEP đa dạng tại các số điện thoại được liệt kê dưới đây.

7 □□□□□□□□□ខ្មែរ (Kmer (Cambodian):
ឯកសារនេះ□□មានសារៈសំខាន់និងត្រូវត្រូវបានបកប្រែភ្លាមៗ ប្រសិនបើអ្នកត្រូវបានបកប្រែឯកសារនេះសូមទំនាក់ទំនងឆ្ពោះជានាយក MassDEP នៅលេខទូរស័ព្ទដ ខែលបានរាយខាងក្រោម។

8 Kriolu Kabuverdianu (Cape Verdean):
Es documento é importante e deve ser traduzido imidiatamente. Se bo precisa des documento traduzido, por favor contacta Director de Diversidade na MassDEP's pa es numero indicode li d'boche.

9 Русский язык (Russian):
Этот документ является важным и должно быть переведено сразу. Если вам нужен этот документ переведенный, пожалуйста, свяжитесь с директором разнообразия MassDEP по адресу телефонных номеров, указанных ниже.

10 العربية (Arabic):
هذه الوثيقة الهامة وينبغي أن تترجم على الفور. اذا كنت بحاجة الى هذه الوثيقة المترجمة، يرجى الاتصال مدير التنوع في MassDEP على أرقام الهواتف المدرجة أدناه.



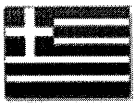
11 한국어 (Korean):
이 문서는 중요하고 즉시 번역해야합니다. 당신이 번역이 문서가 필요하면 아래의 전화 번호로 MassDEP의 다양성 감독에 문의하시기 바랍니다.

12 հայերեն (Armenian):
Այս փաստաթուղթը շատ կարեւոր է եւ պետք է թարգմանել անմիջապես. Եթե Ձեզ անհրաժեշտ է այս փաստաթուղթը թարգմանվել դիմել MassDEP բազմազանությունը տնօրեն է հեռախոսահամարների թվարկված են ստորեւ.

13 فارسی (Farsi (Persian):
این سند مهم است و باید فورا ترجمه شده است.
اگر شما نیاز به این سند ترجمه شده، لطفا با ما تماس تنوع مدیر MassDEP در شماره تلفن های ذکر شده در زیر.

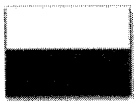
14 Français (French):
Ce document est important et devrait être traduit immédiatement. Si vous avez besoin de ce document traduit, s'il vous plaît communiquer avec le directeur de la diversité MassDEP aux numéros de téléphone indiqués ci-dessous.

15 Deutsch (German):
Dieses Dokument ist wichtig und sollte sofort übersetzt werden, Wenn Sie dieses Dokument übersetzt benötigen, wenden Sie sich bitte Diversity Director MassDEP die in den unten aufgeführten Telefonnummern.

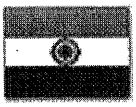


16 Ελληνική (Greek):
Το έγγραφο αυτό είναι σημαντικό και θα πρέπει να μεταφραστούν αμέσως. Αν χρειάζεστε αυτό το έγγραφο μεταφράζεται, παρακαλούμε επικοινωνήστε Diversity Director MassDEP κατά τους αριθμούς τηλεφώνου που αναγράφεται πιο κάτω.

17 Italiano (Italian):
Questo documento è importante e dovrebbe essere tradotto immediatamente. Se avete bisogno di questo documento tradotto, si prega di contattare la diversità Direttore di MassDEP ai numeri di telefono elencati di seguito.



18 Język Polski (Polish):
Dokument ten jest ważny i powinien być natychmiast przetłumaczone. Jeśli potrzebujesz tego dokumentu tłumaczone, prosimy o kontakt z Dyrektorem MassDEP w różnorodności na numery telefonów wymienionych poniżej.



19 हिन्दी (Hindi):
यह दस्तावेज महत्वपूर्ण है और तुरंत अनुवाद किया जाना चाहिए. आप अनुवाद इस दस्तावेज़ की जरूरत है, नीचे सूचीबद्ध फोन नंबरों पर MassDEP की विविधता निदेशक से संपर्क करें.

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DRAFT Findings of Fact in Support of
DRAFT Water Management Permit #9P4-4-22-172.04
Southport on Cape Cod Development LLC

The Department of Environmental Protection ("MassDEP" or "the Department") has completed its review of the Southport on Cape Cod Development LLC Water Management Act (WMA) permit application. This review was conducted in regard to the permit for Southport on Cape Cod Development LLC ("Southport") to withdraw water from the Cape Cod Basin. The Department hereby **proposes to issue** the Water Management Permit #9P4-4-22-172.04 (the "Permit") in accordance with the Water Management Act (M.G.L. 21G). The Department makes the following Findings of Fact in support of the attached DRAFT Permit, and includes herewith its reasons for issuing the Permit and for the conditions of approval imposed, as required by M.G.L. c. 21G, § 11, and 310 CMR 36.00. The Permit is being issued since such action is necessary for the promotion of the purposes of M.G.L. c. 21G. The Department may modify, suspend or terminate the Permit, after notice and hearing, for violations of its conditions, of M.G.L. c. 21G, or of regulations adopted or orders issued by the Department, and when deemed necessary for the promotion of the purposes of the Water Management Act.

The Department adopted revised Water Management Regulations at 310 CMR 36.00 on November 7, 2014, (described in greater detail below). Since that time, the Department has been working closely with each Water Management Act (WMA) permittee to fully consider all aspects of their individual situations and ensure thoughtful and implementable draft permits.

Withdrawal Description and History

The Southport development began in the 1990s. Potable water is supplied by the Mashpee Water District, while irrigation water is withdrawn from the property's six irrigation wells. The irrigation wells were installed in 2000 and 2001. Irrigation withdrawals are applied to residential landscaping and a 9-hole golf course. The golf course is complete and approximately 727 of the planned 750 condominium units are built to date. Southport estimates that development will be completed in 2018. The property includes one natural pond (Martha's Pond) and three lined manmade ponds, none of which are used as irrigation sources.

Southport underwent the MEPA process in the mid-1980s, when WMA regulations were not in existence; therefore, a WMA permit application was not filed at the time. Southport first applied for a WMA permit in June 2015 and sought authorization to withdraw 24.78 million gallons per year (MGY); however, little data was available at the time on historic withdrawals. After a pumping test in November 2015, and metering withdrawals in 2016, Southport determined that its water needs were

greater than originally requested. Southport reapplied in July 2017 seeking authorization to withdraw 36.66 MGY (0.17 million gallons per day (MGD) over 214 days) from the six existing irrigation wells.

The Water Management Act (M.G.L. c. 21G)

The WMA requires the Department to issue permits that balance a variety of factors including without limitation:

- Impact of the withdrawal on other water sources;
- Water available within the safe yield of the water source;
- Reasonable protection of existing water uses, land values, investments and enterprises;
- Proposed use of the water and other existing or projected uses of water from the water source;
- Municipal and Massachusetts Water Resources Commission (WRC) water resource management plans;
- Reasonable conservation consistent with efficient water use;
- Reasonable protection of public drinking water supplies, water quality, wastewater treatment capacity, waste assimilation capacity, groundwater recharge areas, navigation, hydropower resources, water-based recreation, wetland habitat, fish and wildlife, agriculture, flood plains; and
- Reasonable economic development and job creation.

Water Management Regulation Revisions

In 2010 the Executive Office of Energy and Environmental Affairs (EEA) convened the Sustainable Water Management Initiative (SWMI) for the purpose of incorporating the best available science into the management of the Commonwealth's water resources. SWMI was a multi-year process that included a wide range of stakeholders and support from the Departments of Environmental Protection, Fish and Game, and Conservation and Recreation. In November 2012 the *Massachusetts Sustainable Water Management Initiative Framework Summary* (http://www.mass.gov/eea/docs/eea/water/swmi-framework-nov-2012.pdf) was released.

On November 7, 2014, the Department adopted revised Water Management Regulations at 310 CMR 36.00 that incorporate elements of the SWMI framework and the Water Conservation Standards adopted by the Massachusetts WRC. The regulations reflect a carefully developed balance to protect the health of Massachusetts' water bodies while meeting the needs of businesses and communities for water.

Without limitation, the Department has incorporated the following into Water Management permitting:

- Safe yield determinations for the major river basins based on a new methodology developed through SWMI. For water sources where an estimate of natural annualized streamflow is not applicable because the water source is groundwater-driven, the Safe Yield is determined through estimates of groundwater recharge during drought conditions. For more information on the Safe Yield methodology, go to the November 28, 2012 SWMI Framework Summary and Appendices;
- Environmental protections developed through SWMI, including without limitation;
    - protection for coldwater fish resources;
    - minimization of withdrawal impacts in areas stressed by groundwater use;
    - mitigation of the impacts of increasing withdrawals; and
- The special permit conditions in each Water Management Act permit.

Safe Yield in the Cape Cod Basin

This permit is being issued in accordance with the Safe Yield methodology adopted by the Department on November 7, 2014, in the Regulations at 310 CMR 36.13. As of the date of issuance of this permit, the Safe Yield calculation for the Cape Cod Basin is 266.0 million gallons per day (MGD), and total registered and permitted withdrawals are 51.9 MGD. The maximum withdrawals that are authorized in this permit, and all other permits currently under review by the Department within the Cape Cod Basin, will be within the Safe Yield and conditioned in accordance with the regulations. Withdrawal authorizations may be further limited by other factors, such as the impact to local resources, water quality constraints, pumping rate limits placed on individual wells and surface water supplies, and the regulatory requirement that permit holders demonstrate a need for the water, which for public water systems is done through Water Needs Forecasts prepared by the Department of Conservation and Recreation.

Findings of Fact for Special Permit Conditions

The following Findings of Fact for the special conditions included in the Permit generally describe the rationale and background for each special condition in the Permit. This Findings of Fact also explain any changes to special conditions from prior permits, when applicable. This summary of permit special conditions is not intended to, and should not be construed as, modifying any of the permit special conditions. In the event of any ambiguity or inconsistency between this summary and the actual permit conditions, the permit language shall control.

Special Condition 1, Maximum Authorized Annual Average Withdrawal Volume
Special Condition 1 authorizes an annual average withdrawal volume of 36.66 MGY of water, or 0.17 MGD over 214 days (April – October) annually, from its six groundwater sources in the Cape Cod Basin.

Special Condition 2, Maximum Daily Withdrawal Volume
Special Condition 2 authorizes a maximum daily withdrawal volume for the sources included in the DRAFT Permit. Southport shall report the monthly withdrawal volume and maximum daily withdrawal of each of its six source wells in the WMA Annual Report Form. The maximum authorized daily withdrawal volumes for the permitted wells are provided in Table 3. These volumes are based on the pumping rates of each withdrawal point in the pumping tests conducted in October and November of 2015, and as indicated in Southport's February 2016 pumping test report. In its July 10, 2017 response to the Department's April 15, 2016 Order to Complete, Southport requested that two of the six source wells (the Friendship Circle and Pine Hill wells) be assigned a maximum daily withdrawal volume based on the yield reported in the well installation record, which was 0.024 MGD for both wells. The Department granted the request.

General Condition 8 of the Permit requires annual calibration of all source meters, and a calibration report must be submitted with the WMA Annual Report Form each year. In recent correspondence with the Department, Southport noted that the Golf Course Well can be calibrated; however, meters on the five smaller wells would need to be replaced if the reading accuracy is outside of the Department's acceptable range, which is 90% to 104% based on the American Water Works Association M6 Manual. Therefore, as an alternative to calibration, Southport shall test the meters of the five smaller wells annually and replace them as needed.

Special Condition 3, Seasonal Demand Management Plan for Golf Course Irrigation
In its WMA permit application Southport submitted a Seasonal Demand Management Plan (SDMP) that has been incorporated into the DRAFT Permit (Attachment A). Consistent with good water conservation practices, all permitted golf courses are required to implement a SDMP as a condition of their WMA permit. The SDMP includes best management practices (BMPs) aimed at water conservation. In addition, the SDMP restricts nonessential outdoor water use between May 1st and September 30th when the Massachusetts Drought Management Task Force declares a drought level of "Advisory" or higher ("Watch, Warning or Emergency") for the region in which the golf course is located.

The SDMP shall also be implemented at times when groundwater levels at a USGS monitoring well fall below a groundwater trigger for 60 consecutive days. The monthly trigger levels are the period of record's monthly 25th percentile depth to water levels in a local well, as determined and published by the USGS. Restrictions could start on May 1, so monitoring of the well shall begin on March 1 of each year. Once implemented, the restrictions shall remain in place until the daily value of the groundwater levels at the assigned USGS monitoring well have recovered to less than the trigger for 30 consecutive days (when the water table elevation has risen above the trigger level).

Southport has been assigned the following USGS monitoring well: #414124070265901 - MA-SDW 253 Sandwich, MA. The monthly groundwater trigger values are shown in Table 4 of the DRAFT permit. Should the reliability of the groundwater measurements at this well be so impaired as to question its accuracy, the Permittee may request the Department's review and approval to transfer to another well to trigger restrictions. The Department reserves the right to require use of a different well.

Southport shall be responsible for tracking the Massachusetts Drought Management Task Force drought declarations and recording when drought-triggered restrictions are implemented. Southport shall also be responsible for tracking groundwater levels and recording when groundwater-triggered restrictions are implemented. See the groundwater- and drought-tracking instructions (Attachment B) for guidance.

The Department offers two SDMP options for water use reduction in table format. The Acres Table requires golf courses to identify the number of irrigated acres for tees and greens, fairways, roughs, landscaping and ornamentals, along with a percent reduction per unit area with worsening drought. The Time Table requires irrigation reductions based on changes to the timing of irrigation cycles. Southport selected the Acres Table approach as shown in Attachment A.

Special Condition 4, Water Conservation Plan for Residential Landscape Irrigation
In its WMA permit application, Southport submitted a Water Conservation Plan for its residential landscape irrigation, which has been incorporated into the DRAFT Permit (Attachment C). Similar to the SDMP (Special Condition 3), the Water Conservation Plan includes BMPs to minimize water use. The plan also restricts residential landscape irrigation between May 1st and September 30th when two conditions are in effect: 1) when the Massachusetts Drought Management Task Force declares a drought level of "Advisory" or higher (Watch, Warning or Emergency) for the Cape Cod Region; and 2) when groundwater levels at the assigned USGS monitoring well fall below the groundwater trigger for 60 consecutive days. Residential landscape irrigation is allowed no more than two days per week before 9 am and after 5 pm when these two conditions occur. Note that, unlike Special Condition 3, restrictions are required only when both conditions are in effect. Also note that these restrictions do not apply to hand-held watering.

Special Condition 5, Coldwater Fish Resource (CFR) Protection was incorporated into the Water Management Regulations in November 2014. Pursuant to 310 CMR 26.22, a CFR optimization was required of Southport because its withdrawals have been determined to impact a CFR, namely the Quashnet River. The Department based its determination on results of the November 2015 pumping test, as indicated in a letter from the Department to Southport dated March 15, 2016. The Massachusetts Department of Fish and Game's Division of Fish and Wildlife (DFW) and Division of Marine Fisheries (MarineFisheries) provided comments to the Department regarding the Quashnet River's historic and current fish habitat conditions, and they strongly support restoration efforts planned for this CFR. Operational changes (e.g. pumping certain wells more than others during low-flow periods) would not be effective at minimizing impacts to the CFR, because the source wells are similar distances from the river and are not divided among multiple subbasins.

Based on these findings, the Department recommended that Southport include CFR habitat improvement in its mitigation plan (Special Condition 6). The Department further recommended that Southport consult with the Town of Mashpee based on the Town's cranberry bog restoration plans, which are discussed under Special Condition 6 below. Southport followed these recommendations and will have fulfilled the CFR optimization requirements upon carrying out its mitigation plan.

Special Condition 6, Mitigation Plan

The DRAFT Permit includes a condition that requires mitigation of withdrawals over a baseline volume, if feasible, if future withdrawals exceed the assigned baseline volume. Baseline withdrawal means the volume of water withdrawn during calendar year 2005 plus 5%, or the average annual volume withdrawn from 2003 through 2005 plus 5%, whichever is greater provided that:

(a) baseline cannot be less than a permittee's registered volume;
(b) baseline cannot be greater than the permittee's authorized volume for 2005; and
(c) if, during the period from 2003 to 2005, the permittee's withdrawals from the water source were interrupted due to contamination of the source or construction of a treatment plant, the Department will use best available data to establish a baseline volume from the water source.

The Department accepted an estimate of Southport's 2005 water use based on the following approach, as summarized in Southport's WMA permit application:

> Southport obtained aerial photography showing the extent of irrigated landscape (including the golf course) at Southport in 2005, and compared the acreage then being irrigated to current 2016 irrigated landscaped acreage. The proportion of Southport's irrigated acreage that was developed and irrigated as of 2005 was used to estimate 2005 Southport baseline water use, as follows. The 2016 water use volume was multiplied by the ratio of irrigated land in 2005 to irrigated land in 2016. A 5% buffer (as allowed by MassDEP for establishment of the 2005 baseline) was then applied to the 2005 calculated use. The resulting baseline water volume estimate for 2005 is 29.55 MGY.

The annual withdrawal volume requested in Southport's WMA Application (36.66 MGY) is 7.11 MGY greater than the 2005 baseline withdrawal estimate (29.55 MGY); therefore, Southport was required to develop a plan to mitigate 7.11 MGY, or 0.033 MGD over a 214 day season.

Pursuant to 310 CMR 36.22(6)(a), permittees must first pursue direct mitigation options. Southport did evaluate direct mitigation potential but found no feasible options. Neither surface water releases nor infiltration and inflow removal are applicable to Southport. Regarding stormwater recharge, Southport performed an evaluation as described in its WMA permit application:

> Southport "investigated whether areas of directly connected impervious surface at the development exist that could be disconnected, so that new or increased direct storm water

infiltration through soil to the aquifer could occur. Within the Southport development, potential opportunities for such direct mitigation do not appear viable. Storm water management systems installed at Southport were not constructed with direct, piped discharge to surface water systems that are within or surround the development. Review of aerial photography indicates that the majority of the pre-2005 storm water BMP's utilized the rapidly draining soils to capture and infiltrate storm water runoff from impervious surfaces. The one storm water outfall and catchment area that is routed towards Martha Pond and appears to have a direct connection during peak flows is, based on Weston & Sampson site visits in 2015 and 2016 along with 2014 aerial photographic interpretation, a newer system constructed well after 2005. As such it is ineligible under WMA regulations and guidance for disconnection to provide direct mitigation to offset increases in water withdrawals above a 2005 baseline. It is also our understanding that future planned storm water management systems, even if they were to function as directly recharging groundwater, are not eligible for direct mitigation credits under MassDEP policy."

Due to the lack of feasible direct mitigation, and per the Department's CFR recommendations noted under Special Condition 5, Southport instead pursued indirect mitigation in the form of CFR habitat restoration. Southport consulted with the Town of Mashpee Conservation Commission regarding its habitat restoration plans along the Quashnet River, and both parties agreed that a habitat restoration fund contribution would be the most appropriate means of assistance. The Town is currently planning a project to address longstanding restoration needs at the Johns Pond Dam and along the Upper Quashnet River. In its WMA permit application, Southport included a project description and plan for its fund contribution:

"The Town of Mashpee, through its Conservation Commission, has sought for a number of years to fund and implement improvements that are critically needed to restore the functioning of the fish ladder located at the entrance of the Quashnet River into Johns Pond. The Upper Quashnet River offers habitat for brook trout and other fish species, and serves as a seasonal herring run to and from Johns Pond, requiring a functioning fish ladder to enable migratory movement. Ongoing sedimentation associated with severe erosion of portions of the Johns Pond dam embankments has blocked and seriously compromised the functioning of the existing fish ladder for a number of years, requiring repeated use of heavy machinery to dig out areas near the fish ladder. Based on several studies commissioned by the Town, the most recent being an assessment by Greg Berman of Woods Hole Sea Grant and Cape Cod Cooperative Extension dated April 24, 2017, the Town's Conservation Commission Agent and Herring Warden (Drew McManus) has recommended repair measures to eliminate sand runoff and restore the fish ladder, including re-grading and planting or armoring of upstream and downstream channels and embankments and removal of leaning trees along the channel. These repairs would both restore the functionality of the fish ladder and reduce or prevent sedimentation and turbidity that can generally degrade the Quashnet River fish habitat. The current estimated cost of the restoration project according to the Conservation Agent, including estimated construction, planning/design, and permitting costs, is $158,000.

Southport met with the Town of Mashpee Conservation Agent and proposed to contribute funding in the amount of $40,000 toward the Town's implementation of the above-described project. In the meeting Mr. McManus strongly endorsed this level of funding contribution as highly meaningful to seed and initiate this important project. It is Southport's understanding that its contribution could be made into a Town of Mashpee Conservation Fund dedicated to projects such as habitat restoration and enhancement. Southport's $40,000 contribution would

allow design and permitting of the project to commence and proceed while additional appropriate state and federal resources are secured to fund the remainder of the project cost."

In its WMA permit application, Southport stated that it is prepared to enter into a funding agreement with the Town of Mashpee to deposit the $40,000, as described above, into the Town's dedicated conservation fund, known as the Lands and Maintenance Fund, and that the full amount would be deposited immediately upon the Department's approval of Southport's WMA permit application.

The Department awarded 13 credits to the project based on the indirect mitigation credit system for installing and maintaining a fishway. Specifically, 10 credits were awarded due to the project ranking within the top 20 projects on MarineFisheries' diadromous fish passage prioritization list for the Cape Cod drainage. Up to 5 additional credits can be awarded if the waterbody segment is listed as a cold water fishery resource and based on other evidence that the project is a state, regional, or local priority. In consultation with MarineFisheries, the Department awarded 3 additional credits based on the following factors:

- the Quashnet River is listed as a cold water fishery resource by the Department of Fish and Game;
- the project has been identified as an ecological priority by a regional plan[1];
- the project is part of larger restoration efforts, namely the Upper Quashnet bog restoration and the greater Waquoit Bay stream restoration;
- the project is a part of a long-standing goal of the Mashpee Conservation Commission to restore the Upper Quashnet, with feasibility studies dating back to 2007;
- the project will improve brook trout habitat along with herring passage, because it aims to reduce sedimentation and turbidity by rechanneling upstream and downstream of the fish ladder; and
- the Quashnet is a site for on-going fish habitat and surface-water/groundwater interaction research. Improvements resulting from this project could potentially be monitored through research in the area.

Because Southport's $40,000 contribution will cover 25.3% of the total estimated cost of $158,000, Southport will receive 25.3% of the 13 credits, or 3.3 credits (0.033 mgd), which satisfies Southport's mitigation need.

On August 7, 2017, Southport submitted a signed agreement with the Mashpee Conservation Commission (Attachment D), which contains information regarding the habitat restoration project. This information includes the project scope and budget, site photos, the value and timing of Southport's contribution, and a commitment from the Mashpee Conservation Commission to sign an O&M agreement with MarineFisheries per M.G.L. c. 130, § 19.

Minimization of Groundwater Withdrawal Impacts in Stressed Subbasins, requires permittees with permitted groundwater sources in subbasins[2] with net groundwater depletion of 25% or more during August to minimize their withdrawal impacts on those subbasins to the greatest extent feasible.

Because Southport's sources are located where August net depletion has not been established, minimization measures are not required.

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[1] The *Waquoit Bay Stream Restoration Master Plan* (December 2010, The Louis Berger Group, Inc.) ranked the Upper Quashnet River restoration highest among all projects evaluated under the plan.

[2] Subbasins used for WMA permitting are the 1,395 subbasins delineated by the U.S. Geological Survey in *Indicators of Streamflow Alteration, Habitat Fragmentation, Impervious Cover, and Water Quality for Massachusetts Stream Basins* (Weiskel *et al.*, 2010, USGS SIR 2009-5272).

Commonwealth of Massachusetts
Executive Office of Energy & Environmental Affairs

Department of Environmental Protection

One Winter Street Boston, MA 02108 • 617-292-5500

WATER WITHDRAWAL PERMIT
M.G.L. c. 21G

This issuance of Permit #9P4-4-22-172.04 is approved pursuant to the Massachusetts Water Management Act (WMA) for the sole purpose of authorizing the withdrawal of a volume of water as stated below and subject to the following special and general conditions. This permit conveys no right in or to any property.

PERMIT NUMBER: 9P4-4-22-172.04 **RIVER BASIN:** Cape Cod

PERMITTEE: Southport on Cape Cod Development LLC
c/o Charles Katz CPA, 410 Boston Post Rd, Ste 28
Attn: Eric A. Katz
Sudbury, MA 01776

ISSUANCE DATE: MONTH DAY, YEAR
EXPIRATION DATE: November 30, 2030

TYPE AND NUMBER OF WITHDRAWAL POINTS:
Groundwater: 6
Surface Water: 0

USE: Residential landscape and golf course irrigation
DAYS OF OPERATION: 214 (April – October)

LOCATION:

Table 1. Withdrawal Point Identification

Source	Latitude	Longitude	Location
Golf Course Well	41° 37' 39.14" N	70° 30' 33.19" W	Pine Hill Blvd, Mashpee
Upland Circle Well	41° 37' 26.72" N	70° 30' 29.63" W	Pine Hill Blvd, Mashpee
Friendship Circle Well	41° 37' 23.74" N	70° 30' 22.57" W	Pine Hill Blvd, Mashpee
Dog Leg Well	41° 37' 37.73" N	70° 30' 20.77" W	Pine Hill Blvd, Mashpee
Pine Hill Well	41° 37' 28.92" N	70° 30' 25.06" W	Pine Hill Blvd, Mashpee
Windward Well	41° 37' 28.38" N	70° 30' 26.16" W	Pine Hill Blvd, Mashpee

SPECIAL CONDITIONS

1. Maximum Authorized Annual Average Withdrawal Volume

This Permit authorizes an annual average withdrawal volume of 36.66 million gallons per year (MGY) of water, or 0.17 million gallons per day (MGD) over 214 days (April – October) annually, from the six Southport on Cape Cod Development LLC (Southport) groundwater sources in the Cape Cod Basin. Table 2 provides the authorized annual average withdrawal volume per permit period. Withdrawals from each of the six sources shall be reported in the WMA Annual Report Forms each year.

Table 2. Maximum Authorized Annual Average Withdrawal Volumes per Permit Period

Permit Periods	Permit	
	Daily Average (MGD)	Total Annual (MGY)
M/D/YYYY to 11/30/2020	0.17	36.66
12/1/2020 to 11/30/2025	0.17	36.66
12/1/2025 to 11/30/2030	0.17	36.66

2. Maximum Authorized Daily Withdrawal Volume

Withdrawals from Southport's permitted source are not to exceed the approved maximum daily rate listed in Table 3 without advance written approval from the Department.

Table 3. Maximum Authorized Daily Withdrawal Volume*

Source	**Maximum Daily Rate** (MGD)
Golf Course Well	0.641
Upland Circle Well	0.028
Friendship Circle Well	0.024
Dog Leg Well	0.029
Pine Hill Well	0.024
Windward Well	0.035

*For the five flow meters that cannot be calibrated, Southport shall test the meters annually and replace them as needed. Please refer to General Condition 8 below for further metering requirements.

3. Seasonal Demand Management Plan for Golf Course Irrigation

Southport's Seasonal Demand Management Plan is included as a condition of the Permit and is provided in Attachment A. Southport shall implement the water conservation Best Management Practices (BMPs) indicated in the plan.

Southport shall limit nonessential outdoor water use from May 1st through September 30th as outlined in the instructions for tracking groundwater levels and drought declarations (Attachment B). At a minimum, reductions shall commence when the Massachusetts Drought Management Task Force declares a drought level of "Advisory" or higher ("Watch, Warning or Emergency") for the Cape Cod Region, or when groundwater levels fall below the groundwater triggers for 60 consecutive days. The groundwater-triggered response actions shall follow the drought-triggered response actions at the Advisory level.

Once implemented, the groundwater-triggered reductions shall remain in place until the daily value of the groundwater levels at the assigned USGS monitoring well have recovered to less than the trigger for 30 consecutive days (when the water table elevation has risen above the trigger level). Southport has been assigned the following USGS monitoring well: #414124070265901 - MA-SDW 253 Sandwich, MA. The groundwater trigger values are provided in Table 4. Should the reliability of the groundwater measurements at this well be so impaired as to question their accuracy, the Permittee may request the Department's review and approval to transfer to another well to trigger restrictions. The Department reserves the right to require use of a different well.

Southport shall be responsible for tracking the Massachusetts Drought Management Task Force drought declarations and recording when drought-triggered restrictions are implemented. Southport shall also be responsible for tracking groundwater levels and recording when groundwater-triggered restrictions are implemented. See Attachment B for guidance. Nothing in this permit shall prevent the Permittee from implementing water use restrictions that are more restrictive than those set forth in this permit.

Table 4. Groundwater-level trigger values

Groundwater-Level Triggers (feet below ground surface) for 414124070265901 - MA-SDW 253 Sandwich, MA						
March	April	May	June	July	August	Sept
50.96	50.84	50.37	50.49	50.70	50.80	51.08

4. Water Conservation Plan for Residential Landscape Irrigation

Southport's Water Conservation Plan for Residential Landscape Irrigation is included as a condition of the Permit and is provided in Attachment C. Southport shall implement the water conservation Best Management Practices (BMPs) indicated in the plan.

Southport shall limit residential landscape irrigation from May 1st through September 30th as outlined in the instructions for tracking groundwater levels and drought declarations (Attachment B). At a minimum, reductions shall commence when the Massachusetts Drought Management Task Force declares a drought level of "Advisory" or higher ("Watch, Warning or Emergency") for the Cape Cod Region, and when groundwater levels fall below the groundwater triggers for 60 consecutive days. Residential landscape irrigation is allowed no more than two days per week before 9 am and after 5 pm when these two conditions occur. Note that the restrictions do not apply to hand-held watering.

Once implemented, restrictions shall remain in place until either the drought declaration has been lifted or the daily value of the groundwater levels at the assigned USGS monitoring well have recovered to less than the trigger for 30 consecutive days (when the water table elevation has risen above the trigger level). Southport has been assigned the following USGS monitoring well: #414124070265901 - MA-SDW 253 Sandwich, MA. The groundwater trigger values are provided in Table 4.

Southport shall be responsible for tracking groundwater levels and the Massachusetts Drought Management Task Force drought declarations. Southport shall also be responsible recording when the restrictions are implemented. See Attachment B for guidance. Nothing in this permit shall prevent the Permittee from implementing water use restrictions that are more restrictive than those set forth in this permit.

5. Coldwater Fish Resource (CFR) Protection

Pursuant to 310 CMR 26.22, CFR optimization is required of Southport based on the potential withdrawal impacts to the Quashnet River. In consultation with the Massachusetts Department of Fish and Game (MassDFG) and the Town of Mashpee Conservation Commission, the Department determined that the most appropriate form of CFR optimization would be to assist with habitat restoration efforts in the Upper Quashnet River, as specified in Southport's mitigation plan (Special Condition 6). Southport will have fulfilled the CFR optimization requirements upon carrying out its mitigation plan.

6. Mitigation Plan

Southport's baseline volume is 29.55 MGY, or 0.14 MGD over a 214-day season. The annual average withdrawal volume authorized in this permit (0.17 MGD) is 0.033 MGD above the baseline volume. Southport shall mitigate the impacts of its withdrawals above baseline through a habitat restoration fund contribution to the Town of Mashpee. Southport shall contribute $40,000 to the Town of Mashpee's Lands and Maintenance Fund, to be applied toward the Johns Pond Dam and Fish Ladder Project along the Upper Quashnet River. Southport shall submit payment to the Town of Mashpee within one month of issuance of the Permit. Proof of the contribution shall be submitted to the Department immediately thereafter.

Attachment D is a signed agreement between Southport and the Mashpee Conservation Commission. It contains information required to receive mitigation credit, such as the project scope and budget, site photos, the value and timing of Southport's contribution, and a commitment from the Mashpee Conservation Commission to sign an O&M agreement with the MassDFG Division of Marine Fisheries per M.G.L. c. 130, § 19.

GENERAL PERMIT CONDITIONS (applicable to all Permittees)

No withdrawal in excess of 100,000 gallons per day over the registered volume (if any) shall be made following the expiration of this permit, unless before that date the Department has received a renewal permit application pursuant to and in compliance with 310 CMR 36.00.

1. **Duty to Comply** The Permittee shall comply at all times with the terms and conditions of this permit, the Act and all applicable State and Federal statutes and regulations.

2. **Operation and Maintenance** The Permittee shall at all times properly operate and maintain all facilities and equipment installed or used to withdraw up to the authorized volume so as not to impair the purposes and interests of the Act.
3. **Entry and Inspections** The Permittee or the Permittee's agent shall allow personnel or authorized agents or employees of MassDEP to enter and examine any property, inspect and monitor the withdrawal, and inspect and copy any relevant records, for the purpose of determining compliance with this permit, the Act or the regulations published pursuant thereto, upon presentation of proper identification and an oral statement of purpose.
4. **Water Emergency** Withdrawal volumes authorized by this permit are subject to restriction in any water emergency declared by MassDEP pursuant to M.G.L. c. 21G, §§ 15-17, M.G.L. c. 111, § 160, or any other enabling authority.
5. **Transfer of Permits** This permit shall not be transferred in whole or in part unless and until MassDEP approves such transfer in writing, pursuant to a transfer application on forms provided by MassDEP requesting such approval and received by MassDEP at least thirty (30) days before the effective date of the proposed transfer. No transfer application shall be deemed filed unless it is accompanied by the applicable transfer fee established by 310 CMR 36.37.
6. **Duty to Report** The Permittee shall submit annually, on a form provided by MassDEP, a certified statement of the withdrawal. Such report is to be received by MassDEP by the date specified by MassDEP. Such report must be mailed or hand delivered to the address specified on the report form.
7. **Duty to Maintain Records** The Permittee shall be responsible for maintaining withdrawal records as specified by this permit.
8. **Metering** Withdrawal points shall be metered. Meters shall be calibrated annually. Meters shall be maintained and replaced as necessary to ensure the accuracy of the withdrawal records.
9. **Amendment, Suspension or Termination** The Department may amend, suspend or terminate this permit in accordance with M.G.L. c. 21G or 310 CMR 36.29.

APPEAL RIGHTS AND TIME LIMITS

This permit is a decision of MassDEP. Any person aggrieved by this decision may request an adjudicatory hearing. Any such request must be made in writing, by certified mail and received by MassDEP within twenty-one (21) days of the date of receipt of this permit.

No request for an appeal of this permit shall be validly filed unless a copy of the request is sent by certified mail, or delivered by hand to the local water resources management official in the community in which the withdrawal point is located; and for any person appealing this decision, who is not the applicant, unless such person notifies the permit applicant of the appeal in writing by certified mail or by hand within five (5) days of mailing the appeal to MassDEP.

CONTENTS OF HEARING REQUEST

310 CMR 1.01(6)(b) requires the request to include a clear and concise statement of the facts which are the grounds for the request and the relief sought. In addition, the request must include a statement of the reasons why the decision of MassDEP is not consistent with applicable rules and regulations, and for any person appealing this decision who is not the applicant, a clear and concise statement of how that person is aggrieved by the issuance of his permit.

FILING FEE AND ADDRESS

The hearing request, together with a valid check, payable to the Commonwealth of Massachusetts in the amount of $100 must be mailed to:

Commonwealth of Massachusetts
Department of Environmental Protection
P.O. Box 4062
Boston, MA 02211

The request shall be dismissed if the filing fee is not paid, unless the appellant is exempt or granted a waiver as described below.

EXEMPTIONS

The filing fee is not required if the appellant is a municipality (or municipal agency), county, district of the Commonwealth of Massachusetts, or a municipal housing authority.

WAIVER

MassDEP may waive the adjudicatory hearing filing fee for any person who demonstrates to the satisfaction of MassDEP that the fee will create an undue financial hardship. A person seeking a waiver must file, together with the hearing request, an affidavit setting forth the facts which support the claim of undue hardship.

Rebecca Weidman

Rebecca Weidman, Director
Division of Watershed Management
Bureau of Water Resources

3/7/18
Date

ATTACHMENT A

SEASONAL DEMAND MANAGEMENT PLAN
FOR GOLF COURSE IRRIGATION
SOUTHPORT ON CAPE COD DEVELOPMENT LLC

Golf Course

Seasonal Demand Management Plan
Southport on Cape Cod Development LLC
Mashpee Massachusetts

LIST OF TABLES

Background

This Seasonal Demand Management Plan (Demand Plan) addresses the golf course irrigation system at Southport on Cape Cod Mashpee, Massachusetts. Southport on Cape Cod includes 750 condominium units (600 existing and additional 150 units in development) and a nine-hole golf course of approximately 12.77 acres (Table 1). Potable water is supplied by the Mashpee Water District. Irrigation for the golf course and the landscaping for the residential areas is provided by onsite wells. No potable water is used for outside irrigation. The golf course irrigation system is operated by Southport.

Table 1. Southport on Cape Cod Site Golf Course Area

	Acres
Total Site Area	250.59
Golf Course	12.77

A Demand Plan is required for golf course water suppliers applying for a Water Management Act Permit. The terms Demand Management Plan and Conservation Plan are used interchangeably in the guidance documents and application instructions currently provided by DEP. The following Demand Plan discusses the system sources and demand, provides methods for determining system use patterns and offers a variety of water conservation measures. Finally, Drought Management is included in the Demand Plan to define operational actions that Southport will undertake consistent with Massachusetts Drought Indices.

This Demand Plan was prepared to promote the efficient use of irrigation water within the golf course portion of Southport and to fulfill requirements of the Water Management Act (MGL 21G). This Conservation Plan also complies with the Water Conservation Standards (Section 9, *Lawn and Landscape*, as updated June 2012).

Southport will be responsible for implementing this plan. This Demand Plan presents various ways to reduce irrigation water demands as well as appropriate responses to recognized stages of drought. The Demand Plan includes methodologies to review operational procedures to minimize water losses.

Irrigation System Overview

The golf course irrigation water supply system serves 100% of the golf course and is metered. The golf course irrigation system is supplied by the largest (Well 100156) of six onsite wells shown in Figure 3 of the Southport WMA Permit Application and listed in Table 2 below. Well 100156 also supplies irrigation of landscaping within several portions of the development. Irrigation of the golf course and the residential landscaping is metered separately. (Irrigation for the residential landscaping of Southport is subject of a separate Conservation Plan included in the Permit Application).

The golf course irrigation system includes a single well, meter and valving to allow for separate

distribution to sprinkler systems serving various elements of the golf course, and valving to separate the golf course system from the landscape irrigation system.

Table 2. Southport Irrigation Wells

State Well Number	Well Name	Screened Interval [1]	Test Date	Rate (gpm)
100156	Golf Course	88-108	12/5/2001 11/18/2015	840 445
103395	Upland Circle	65-69	9/18/2000 11/6/2015	20 19
103396	Friendship Circle	66-70	9/18/2000 11/6/2015	20 9
103394	Dog Leg	65-69	4/17/2001 10/29/2015	20 20
103393	Pine Hill (Fairway 7)	65-69	4/17/2001 11/6/2015	20 10.5
	Windward	N/A	10/29/2015	24

Note: 1 Feet Below Ground Surface

Demand Assessment

The system is designed to provide adequate irrigation to meet turf needs during periods of low rainfall. However, actual irrigation is managed to meet the actual needs of various areas of the golf course based on current weather conditions including precipitation, temperature and hours of insolation.

Seasonal Demand

Turf irrigation needs change during the growing season. The growing season is well defined and extends from April through October. Peak months for irrigation are typically June, July and August. Based on 2016 water use, the Southport Golf Course water usage is shown in Table 3. The system is generally drained to protect against freeze damage from November through March. The system is inspected and major maintenance issues are identified at that time.

Table 3. Estimated 2016 Water Use

	Acres	Estimated Use
Total Site Area	250.59	
Golf Course	12.77	4.95 MGY

Notes: 1 Data from RIM Site Map (CAD) as converted to GIS
2 From Water usage data collected in 2016

Minimizing Water Losses

The system operator will record monthly water use information pursuant to the WMA permit. The system operator will monitor the monthly water use information to identify any increases in

water use that may be due to leakage. The system will be subject to weekly inspection and maintenance to minimize transmission losses. Specifically, the distribution system will be monitored for any signs of leakage or loss of system pressure that would indicate losses.

Demand Management

This conservation plan implements demand management recommendations taken from the Massachusetts Water Conservation Standards (June 2012) that are appropriate for a privately owned and operated golf course irrigation system. The recommendations pertinent to Southport are:

- Control outdoor water use,
- Irrigate efficiently,
- Maximize water conservation of automatic irrigation systems, and
- Enhance soil health.

These recommendations are summarized below.

Control Outdoor Water Use

The golf course irrigation system is controlled and operated by the golf course manager under the direction of Southport. Application of water to golf course areas is based on need considering precipitation, temperature and hours of insolation. In addition, the course itself is inspected to confirm its condition. Irrigation system operation is controlled to apply water to each area of the course no more than three times a week during dry periods in July and August. Irrigation is curtailed during and immediately after rain.

Irrigate Efficiently

The irrigation system is designed for uniform application of different course areas (tees, greens and fairways) to provide the most efficient operation. The irrigation system is regularly maintained including weekly examination for correct operation of sprinkler heads and uniformity of application. Southport will maintain a detailed maintenance log to be made available to DEP upon request. The system employs low trajectory sprinkler heads. Wetting agents are employed to maximize irrigation efficiently.

Maximize Water Conservation of Automatic Irrigation Systems

Given the size and nature of the irrigation system, automatic controls are used. The irrigation system is designed to utilize rain sensors that link to timers for the system valves, thus preventing unnecessary watering. Installation of rain sensors throughout the system will be completed for the 2018 irrigation season.

Turf Health

Turf will be aerated at least one a year to promote general health and increase percolation into the turf root zone. Excess application of water is avoided to minimize the risk of diseases and pest infestation.

Education

Ongoing education will include annual training for all staff responsible for golf course irrigation. Water conservation information will be posted at the clubhouse. The information will include a general description of the irrigation system.

Ongoing education of all staff responsible for golf course irrigation will focus on both operation of the golf course irrigation system and maintaining healthy turf while conserving water. Training for operation of the irrigation system will include information in at least the following areas:

- Review of this water conservation plan (Seasonal Demand Management Plan)
- Review of record keeping practices
- Correct system operation and monitoring to assure uniform application,
- Controlling the system to avoid over-irrigation, and
- Review of actions that will be required during the various drought stages and discussed in the Drought Management section.
- Review of any new measures to reduce irrigation demand.

Drought Management Plan

In addition to implementing measures to reduce overall system demands, it is important to identify when regional supplies may be stressed due to drought conditions to maintain an adequate factor of safety in the local water supply. When available water supplies are stressed, it is necessary to reduce demands so that the ground water levels have a chance to recover. Identification off drought indicators and drought stage triggers are essential to an effective drought management plan. Southport will rely on the following drought triggers to restrict non-essential outdoor water use between May 1 and September 30.

Drought Condition Response

The Drought Management Task Force within the Massachusetts Emergency Management Agency (MEMA) monitors drought conditions and assesses the severity of a drought (Massachusetts Drought Management Plan, May, 2013). The assessment of drought conditions is done on a regional basis: Western, Central, Connecticut River Valley, Northeast, Southeast and Cape and Islands. The development is located in Mashpee, Massachusetts and is in the Cape and Islands region. The Drought Management Task Force uses the indices in Table 4 to determine the drought conditions for the state:

Table 4. Drought Severity Indices

Index	Description
Standardized Precipitation Index	An index that reflects soil moisture and precipitation conditions calculated for "look-back" periods.
Crop Moisture Index	An index that reflects short-term soil moisture conditions as used for agriculture; available from the National Climate Data Center
Keetch-Byram Drought Index	An index representing the net effect of evapotranspiration and precipitation in producing cumulative moisture deficiency in deep duff and upper soil layers.
Precipitation	A comparison of measured precipitation amounts to 30-year averages. Cumulative amounts for three-, six-, and 12-month periods are factored into the drought determination.
Groundwater levels	A drought stage determination is based on the number of consecutive months groundwater levels are below normal (lowest 25 percent or period of record).
Streamflows	A drought stage determination is based on the number of consecutive month's streamflow levels are below normal (lowest 25 percent or period of record).
Reservoirs	An index based on the water levels of small, medium and large index reservoirs across the state.

Source: Massachusetts Drought Management Plan, May, 2013

The Task Force has identified five levels of drought: Normal, Advisory, Watch, Warning and Emergency. These levels are used to assess the severity of a drought based on the seven indices discussed above. The Task Force uses the drought indices to assess the drought level on a monthly basis for each of the six regions. The golf course manager will monitor and utilize the recommendations of the Cape and Islands Regional Task Force.

Drought Response Actions

The irrigation system operator will adhere to the recommended five drought condition levels, which follow the Task Force levels: Normal, Advisory, Watch, Warning, and Emergency. Response to each Task Force Level is shown in Table 5 below.

Table 5. Drought Response Measures, Southport on Cape Cod, Golf Course Irrigation System

Drought Level	Tees and Greens		Fairways		Roughs		Landscape and Ornamentals
	Percent	Acres	Percent	Acres	Percent	Acres	Not Irrigated by Golf Course System
Normal	100%	1.5	100%	2.98	100%	9.79	
Advisory (1)	100%	1.5	80%	2.39	50%	4.89	
Watch (1)	100%	1.5	60%	1.79	0	0	
Warning (1)	100%	1.5	40%	1.19	0	0	
Emergency (2)	(2)		(2)		(2)	0	

(1) Nonessential outdoor irrigation use shall not occur between the hours of 9 am and 5 pm except that hand-watering of hot spots may occur at any time.

(2) Mitigation actions to be determined by the Governor's Emergency Proclamation.

In addition, the irrigation system operator will adhere to the recommended Advisory level drought response when water levels in the USGS monitoring well 4141 2407 0265 901 (MA-SDW 253)

decline to or below levels stipulated in the WMA Permit for 60 or more consecutive days, with such response to remain in effect until ground water levels have risen above the stipulated levels for 30 consecutive days.

ATTACHMENT B

Instructions for Accessing U.S. Geologic Survey Groundwater Level and Massachusetts Drought Advisory Information

Groundwater level information is available at the USGS National Water Information System (NWIS): Web Interface. The USGS NWIS default shows Massachusetts groundwater levels in real time, i.e., the most recent, usually hourly, water level measured and recorded at each USGS monitoring well.

Seasonal Limits on Nonessential Outdoor Water Use are implemented when the daily mean depth to water level exceeds the designated trigger for 60 consecutive days (*i.e.*, when the depth to water becomes larger than the trigger value as the water table elevation declines). The daily water level is compared to the trigger for that month. **To determine if restrictions must be implemented on May 1 it is necessary to monitor the daily water level in March and April.**

Mean daily groundwater level readings are available at the USGS NWIS Web Interface at http://waterdata.usgs.gov/ma/nwis/current/?type=gw&group_key=county_cd

- Scroll down to 414124070265901 - MA-SDW 253 Sandwich, MA.
- Click on the station number.
- On the pull-down menu "Available data for this site" choose "Daily data".
- Under "Available Parameters" click on "72019 Water level, depth L".
- Under "Output format" click on "Table" and enter the number of days of records (the default is 7 days; entering 60 will give you the past 60 days of data) and hit "GO".
- The table provides the "Daily Mean Depth to water level, feet below land surface" for the most recent number of days chosen.
- Compare each day's value to its month's trigger value (25^{th} percentile) in your permit. Outdoor water use restrictions must be implemented when the daily depth to water has been at or below (i.e. a greater value than) the trigger values for 60 consecutive days.

Drought Advisory information is available at the Massachusetts Department of Conservation and Recreation (DCR) Drought Status Website at http://www.mass.gov/eea/agencies/dcr/water-res-protection/water-data-tracking/drought-status.html

- The color coded map displays the six drought regions in Massachusetts. Restrictions are implemented when a Drought Advisory, Watch, Warning or Emergency is announced in your region through the DCR website.

ATTACHMENT C

WATER CONSERVATION PLAN
FOR LANDSCAPE IRRIGATION
SOUTHPORT ON CAPE COD DEVELOPMENT LLC

Landscape Irrigation

Water Conservation Plan
Southport on Cape Cod Development LLC
Mashpee Massachusetts

LIST OF TABLES

Background

This Water Conservation Plan addresses the residential landscape irrigation system at Southport on Cape Cod Mashpee, Massachusetts. Southport on Cape Cod includes 750 condominium units (727 existing and additional 23 units in development), a nine-hole golf course and approximately 79.0 acres of additional irrigated landscaping at buildout. Approximately 97 acres of the site have been left in undeveloped woodlands, wetlands and water bodies. The distribution of various land cover types is shown on Figure 2 of the Southport WMA Permit Application and summarized in Table 1. Potable water is supplied by the Mashpee Water District. Irrigation for the golf course and the landscaping for the residential areas is provided by onsite wells. No potable water is used for outside irrigation. The landscape irrigation system for common areas is operated by Southport; control boxes for the system are locked and may be accessed only by authorized Southport property management personnel. Individual residents have no control over or access to any elements of this irrigation system.

Table 1. Southport on Cape Cod Areas

	Acres
Total Site Area	250.59
Golf Course	12.77
Open Woodland	79.44
Ponds (Surface Water)	9.74
Wetlands	7.63
Impervious (Buildings, Road, Driveways)	61.83
Landscaping	79.18

Note: Data from RIM Site Map (CAD) converted to GIS

A Water Demand Management Plan or Conservation Plan is required for water suppliers applying for a Water Management Act Permit. The terms Demand Management Plan and Conservation Plan are used interchangeably in the guidance documents and application instructions currently provided by DEP. The following Landscape Irrigation Water Conservation Plan (Conservation Plan) discusses the anticipated system demand, provides methods for determining system use patterns and offers a variety of demand reduction measures. In addition, a discussion of Drought Management is included in the Conservation Plan to define operational actions that Southport will undertake consistent with Massachusetts Drought Indices.

This Conservation Plan was prepared to promote the efficient use of irrigation water within the development and to fulfill requirements of the Water Management Act (MGL 21G). This Conservation Plan also complies with the Water Conservation Standards (Section 9, *Lawn and Landscape*, as updated June 2012).

Southport will be responsible for implementing this plan. This Conservation Plan presents various ways to reduce irrigation water demands as well as appropriate responses to recognized stages of drought. The Conservation Plan includes methodologies to review operational procedures to minimize water losses.

Irrigation System Overview

The irrigation water supply system serves 100% of the landscaping in the development and is fully metered. The irrigation system is supplied by the six wells shown in Figure 3 of the Southport WMA Permit Application and listed in Table 2 below. One source (Well 100156) also supplies irrigation water for turf within the golf course. The Golf Course is the subject of a separate Seasonal Demand Management Plan included in the Permit Application.

The landscape irrigation system includes 6 wells, meters, and valving at each well head to allow for separate distribution to sprinkler systems serving the golf course and the landscape irrigation.

Table 2. Southport Irrigation Wells

State Well Number	Well Name	Screened Interval [1]	Test Date	Rate (gpm)
100156	Golf Course	88-108	12/5/2001 11/18/2015	840 445
103395	Upland Circle	65-69	9/18/2000 11/6/2015	20 19
103396	Friendship Circle	66-70	9/18/2000 11/6/2015	20 9
103394	Dog Leg	65-69	4/17/2001 10/29/2015	20 20
103393	Pine Hill (Fairway 7)	65-69	4/17/2001 11/6/2015	20 10.5
	Windward	65-69[2]	10/29/2015	24

Note: 1 Feet Below Ground Surface
2 Estimated based on knowledge of well construction at that time

Demand Assessment

The system is designed to provide adequate irrigation during periods of low rainfall. However, actual irrigation is managed to meet the actual needs of the landscaping based on current weather conditions including precipitation, temperature and hours of insolation.

Seasonal Demand

Landscape irrigation practices depend on the growing season. The growing season is well defined and extends from April through October. Peak months for irrigation are typically June, July and August. Based on 2016 water use, the estimated irrigation use at Southport is shown in Table 3. The system is generally drained to protect against freeze damage from November through March.

Table 3. Estimated 2016 Water Use

	Acres	Estimated Use
Total Site Area		
Landscaping	**79.02**	**28.32 MGY**
Golf Course	**12.77**	**4.95 MGY**

Minimizing Water Losses

The system operator will provide record monthly water use information pursuant to the WMA permit. The system operator will monitor the monthly water use information to identify any increases in water use that may be due to leakage. The system will be subject to weekly inspection and maintenance to minimize transmission losses. Specifically, the distribution system will be monitored for any signs of leakage of loss of system pressure that would indicate losses.

Demand Management

This conservation plan implements demand management recommendations taken from the Massachusetts Water Conservation Standards (June 2012) that are appropriate for a privately owned and operated irrigation system. The recommendations pertinent to Southport are:

- Control outdoor water use,
- Infiltrate rainwater,
- Irrigate efficiently,
- Maximize water conservation of automatic irrigation systems,
- Enhance soil health, and
- Mow to highest recommended level.

These recommendations are summarized below.

Control Outdoor Water Use

The landscaping irrigation system is controlled and operated under the direction of Southport. Application of water to landscaping is based on need considering precipitation, temperature and hours of insolation. Irrigation system operation is controlled to apply water to each area of landscaping only as needed during dry periods in July and August. Irrigation is curtailed during and immediately after rain. Southport will observe the same watering restrictions in a drought as the Town of Mashpee applies to non-Southport residences.

Infiltrate Rainwater

The roadway and parking areas of Southport are designed without curbs and storm water collection systems are connected to infiltration vaults. In addition, several impervious areas drain to rain gardens. Therefore, all precipitation, including that which falls on impervious surfaces, is able to infiltrate into the ground as recharge.

Irrigate Efficiently

The irrigation system is designed for uniform application to provide the most efficient operation. The irrigation system is regularly maintained including weekly examination for correct operation of sprinkler heads and uniformity of application. Southport will maintain a detailed maintenance log, to be made available to DEP upon request.

Maximize Water Conservation of Automatic Irrigation Systems

Given the size and nature of the irrigation system, automatic controls are used. The irrigation system is designed to utilize rain sensors that link to timers for the system valves, thus preventing unnecessary watering. Installation of rain sensors throughout the system will be completed for the 2018 irrigation season.

Enhance Soil Health

Landscaping waste is composited to produce loam for soil improvement. Excess water application it avoided to minimize waste and avoid disease and pest problems.

Mow to Highest Recommended Level

Turf in landscaped areas will be mowed to the recommended level (resulting from a mower blade height of 2.5 inches) to enhance turf health and reduce water needs.

Education

Ongoing education will include both residents and all staff responsible for landscape irrigation. Southport management will provide conservation information at the Community Recreation Facility. The information will include a general description of the irrigation system.

Ongoing education of all staff responsible for landscape irrigation will be held annually and will focus on both operation of the irrigation system and maintaining landscaping while conserving water. Training for operation of the irrigation system will include information in at least the following areas:

- Correct system operation and monitoring to assure uniform application,
- Review of this Conservation Plan,
- Review of record-keeping practices,
- Review of any new measures to reduce irrigation demand,
- The role of rain sensors and other means to avoid over-irrigation,
- Techniques to properly maintain automatic irrigation systems,
- Highlighting the environmental benefits of reducing water demands, and
- Review of actions that will be required during the various drought stages as discussed in the Drought Management Section of this Plan.

Efficient irrigation and landscaping techniques will include:

- Maintaining the health of existing native vegetation,
- As needed to maintain the plantings, use of drought tolerant plant species,
- Ensuring adequate depth and type of soil, and
- Mowing lawns at the recommended height (mower blade height of 2.5 inches).

Drought Management Plan

In addition to implementing measures to reduce overall system demands, it is important to identify when system supplies may be stressed due to drought conditions to maintain an adequate factor of safety in the system. When available water supplies are stressed, it is necessary to reduce demands so that the ground water levels have a chance to recover. Identification of drought indicators and drought stage triggers are essential to an effective drought management plan. Southport will rely on the following drought triggers to restrict non-essential outdoor water use between May 1 and September 30.

Drought Condition Response

The Drought Management Task Force within the Massachusetts Emergency Management Agency (MEMA) monitors drought conditions and assesses the severity of a drought (Massachusetts Drought Management Plan, May 2013). The assessment of drought conditions is done on a regional basis: Western, Central, Connecticut River Valley, Northeast, Southeast and Cape and Islands. The development is located in Mashpee, Massachusetts and is in the Cape and Islands region. The Drought Management Task Force uses the indices in Table 4 to determine the drought conditions for the State:

Table 4. Drought Severity Indices

Index	Description
Standardized Precipitation Index	An index that reflects soil moisture and precipitation conditions calculated for "look-back" periods.
Crop Moisture Index	An index that reflects short-term soil moisture conditions as used for agriculture; available from the National Climate Data Center
Keetch-Byram Drought Index	An index representing the net effect of evapotranspiration and precipitation in producing cumulative moisture deficiency in deep duff and upper soil layers.
Precipitation	A comparison of measured precipitation amounts to 30-year averages. Cumulative amounts for three-, six-, and 12-month periods are factored into the drought determination.
Groundwater levels	A drought stage determination is based on the number of consecutive months groundwater levels are below normal (lowest 25 percent or period of record).
Streamflows	A drought stage determination is based on the number of consecutive month's streamflow levels are below normal (lowest 25 percent or period of record).
Reservoirs	An index based on the water levels of small, medium and large index reservoirs across the state.

Source: Massachusetts Drought Management Plan, May 2013

The Task Force has identified five levels of drought: Normal, Advisory, Watch, Warning and Emergency. These levels are used to assess the severity of a drought based on the seven indices discussed above. The Task Force uses the drought indices to assess the drought level on a monthly basis for each of the six regions. The landscape manager will monitor and utilize the recommendations of the Cape and Islands Regional Task Force.

Drought Response Actions

Southport will limit residential landscape irrigation, from May 1 through September 30, when the Massachusetts Drought Management Task Force declares a drought level of "Advisory" or higher ("Watch", "Warning" or "Emergency") and when water levels in the USGS monitoring well 4141

2407 0265 901 (MA-SDW 253) decline to or below levels stipulated in the WMA Permit for 60 or more consecutive days, with such response to remain in effect until ground water levels have risen above the stipulated levels for 30 consecutive days.

Responses to each Task Force Level (taking into account whether MA-SDW 253 groundwater level triggers have also been reached) are shown in Table 5 below.

Table 5. Drought Response Measures, Southport on Cape Cod, Landscape Irrigation System

Drought Task Force Level	Water Level in Well MA-SDW 253	Response
Normal	**Water Level Above Stipulated Level**	Irrigation pursuant to the Conservation Plan
Advisory		Irrigation pursuant to the Conservation Plan, Inspection of system to assure proper operation.
Advisory and Water Level At or Below Stipulated Level		Irrigation restricted to 2 irrigation periods per area per week
Watch	**Water Level At or Below Stipulated Level**	Irrigation restricted to 2 irrigation periods per area per week
Warning		Irrigation restricted to 1 irrigation period per area per week
Emergency		Full restriction of irrigation water use

This means that landscape irrigation will be restricted to no more than two days per week before 9 am and after 5 pm when the Drought Task Force declares a drought level of Advisory or Watch, and MA-SDW 253 is at or below stipulated levels for 60 days. (Note that the required restrictions do not apply to hand-held watering.)

ATTACHMENT D

MITIGATION PLAN DOCUMENTATION
SOUTHPORT ON CAPE COD DEVELOPMENT LLC

- **Letter of Agreement**
- **Mitigation Plan Summary**
- **Project Description**

Town of Mashpee
16 Great Neck Road North
Mashpee, Massachusetts 02649

Conservation Commission

8/7/17
Southport on Cape Cod Development LLC
23 Southport Drive
Mashpee MA 02649

Attention: Ron Bonvie

Re: Dam and Fish Ladder Repair and Restoration (Quashnet River at Johns Pond)

Ladies and Gentlemen:

I am writing to set forth Southport's agreement with the Mashpee Conservation Commission related to Southport's contribution to certain fisheries' habitat improvements near its property.

In connection with Southport's Water Management Act permit application for irrigation water withdrawal and use, the Massachusetts Department of Environmental Protection has asked for confirmation of certain information related to Southport's agreement with Mashpee:

1. Project Description & Location – repair and restoration of the dam and fish ladder on the Quashnet River as it enters Johns Pond (*see Summary of Proposed Mitigation Plan* (May 8, 2017) and the *Town of Mashpee Repair Assessment for Johns Pond Fish Ladder* (May 1, 2107), attached).

2. Contribution Amount & Timing – $40,000 by Southport, to be deposited in the appropriate conservation fund under Mashpee's control promptly upon DEP's final and formal approval of Southport's Water Management Act permit application.

3. Operations & Maintenance Agreement – as required under G.L. ch. 130, s. 19, the Commission will enter into an agreement with the Massachusetts Division of Marine Fisheries before beginning project construction.

I hereby agree that you may provide a copy of this letter to DEP related to Southport's permit application, provided that Southport has first agreed to its terms by your executing as provided below and returning a counterpart original to me for the Commission's files.

Very truly yours,

Drew McManus
Mashpee Conservation Agent
508-539-1400 X8539
amcmanus@mashpeema.gov

Town of Mashpee
16 Great Neck Road North
Mashpee, Massachusetts 02649

Conservation Commission

AGREED:

SOUTHPORT ON CAPE COD DEVELOPMENT LLC

By: _____ MCR
Its Managing Member
Hereunto Duly Authorized
Ronald Bondie MCR

May 8, 2017

Southport on Cape Cod Development LLC (Southport)
WMA Permit Application (BRP WM 03)
MassDEP Transmittal No. X266419

SUMMARY OF PROPOSED MITIGATION PLAN

As required by MassDEP's *Order to Complete* (OTC) dated April 15, 2016, and in compliance with applicable WMA Regulations and Guidance, Southport proposes to contribute to habitat improvement measures benefitting the Quashnet River Coldwater Fisheries Resource, as further described below. This habitat improvement contribution is proposed as indirect mitigation to offset the amount of additional irrigation water withdrawal by Southport, above 2005 baseline use, as proposed and documented in Southport's *Response to OTC* [to be filed prior to June 1, 2017]. The amount of increased withdrawal to be mitigated is 7.11 million gallons per year (MGY)].[1]

Description of Habitat Improvement Project. The Town of Mashpee, through its Conservation Commission, has sought for a number of years to fund and implement improvements that are critically needed to restore the functioning of the fish ladder located at the entrance of the Quashnet River into Johns Pond. The Upper Quashnet River offers habitat for brook trout and other fish species, and serves as a seasonal herring run to and from Johns Pond, requiring a functioning fish ladder to enable migratory movement.

Ongoing sedimentation associated with severe erosion of portions of the Johns Pond dam embankments has blocked and seriously compromised the functioning of the existing fish ladder for a number of years, requiring repeated use of heavy machinery to dig out areas near the fish ladder. Based on several studies commissioned by the Town, the most recent being an assessment by Greg Berman of Woods Hole Sea Grant and Cape Cod Cooperative Extension dated April 24, 2017, the Town's Conservation Commission Agent and Herring Warden (Drew McManus) has recommended repair measures to eliminate sand runoff and restore the fish ladder, including re-grading and planting or armoring of upstream and downstream channels and embankments and removal of leaning trees along the channel. These repairs would both restore the functionality of the fish ladder and reduce or prevent sedimentation and turbidity that can generally degrade the Quashnet River fish habitat. The current estimated the cost of the restoration project according to the Conservation Agent, including estimated construction, planning/design, and permitting costs, is $158,000.

Southport Consultation with Town and Proposed Contribution. Southport met with the Town of Mashpee Conservation Agent and proposed to contribute funding in the amount of $40,000 toward the Town's implementation of the above-described project. In the meeting Mr.

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[1] Based on 2016 measured water use of 33.27 MGY, minus 29.55 MGY of 2005 baseline use, Southport's net current water withdrawal above baseline is 3.72 MGY. Remaining planned Southport residential buildout is projected to increase Southport's total annual water need to 36.66 MGY. Southport will therefore be resubmitting its WMA permit application to reflect this updated withdrawal request. 36.66 MGY minus 29.55 MGY baseline use results in 7.11 MGY to be offset.

McManus strongly endorsed this level of funding contribution as highly meaningful to seed and initiate this important project. It is Southport's understanding that its contribution could be made into a Town of Mashpee Conservation Fund dedicated to projects such as habitat restoration and enhancement. Southport's $40,000 contribution would allow design and permitting of the project to commence and proceed while additional appropriate state and federal resources are secured to fund the remainder of the project cost.

Southport's contribution at this level is well in excess of 20% of the total estimated project cost.[2] As such, the proposed funding contribution is appropriately credited as an offset for Southport's requested increased withdrawal of 7.11 MGY. MassDEP WMA Guidance concerning indirect mitigation indicates that a habitat restoration project, including for example a fish ladder, can be credited to offset 100,000 GPD (equivalent to 36.5 MGY) of additional withdrawal. Accordingly, an appropriate proportional project contribution to cover Southport's requested increase in withdrawal would be 20% [7.11 MGY/ 36.5 MGY= 19.5%].

Timing of Contribution and Next Steps. Southport is prepared to enter into a funding agreement with the Town of Mashpee to deposit $40,000 toward costs of the Johns Pond dam/fish ladder restoration project, as described above, into the dedicated conservation fund that will be identified by the Mashpee Conservation Commission. The full amount would be deposited immediately upon MassDEP approval of Southport's WMA permit application. (An adjusted permit application will be resubmitted shortly to reflect Southport's updated withdrawal request based on water use monitoring since Southport's original 2015 application.)

[2] 20% of estimated project cost in this case would be $31,600. $40,000 is 25% of the current estimated project cost.

Town of Mashpee
16 Great Neck Road North
Mashpee, Massachusetts 02649

Conservation Commission

May 1, 2017

TO: Andrew Gottleib (Town of Mashpee Selectman)

FROM: Drew McManus (Mashpee Conservation Agent/Herring Warden)

RE: Repair assessment for the Johns Pond fish ladder

Andrew,

The following is an assessment of the Johns Pond fish ladder, including current issues, proposed solutions and cost estimates:

Current issues:

- Severe erosion of the up and downstream embankments associated with the fish ladder
- No established benchmark of water elevation for Johns Pond
- Lack of an operations and maintenance plan (O&M) for the fish ladder

Proposed solutions:

- **Erosion Control upstream channel/embankments-** Re-grade both sides of upstream channel. Existing rock/concrete jetty should be rebuilt and raised up in elevation so it is above the elevation of the adjacent sandy beach to eliminate sand runoff into the upstream channel from the beach side of the ladder. Remove unconsolidated materials from the other side of the embankment (opposite the beach), re-grade this area and install native plantings or consider hard armoring of the embankment.

- **Erosion Control on the downstream channel/embankments-** Re-grade both sides of the channel and remove leaning trees. Implement either hard or soft solution erosion controls (coir fiber logs planted with native vegetation or riprap cover after grading.

- **Water elevation/benchmark establishment. Operation and Maintenance Plan-** A detailed hydraulic and hydrologic analysis of the pond to assess capacity of the structure to handle the current impoundment of water and to assess if the current fish ladder design is adequate for fish passage into Johns Pond

These proposed solutions and associated estimates were recommended in the 2009 Phase I inspection of the Johns Pond fish ladder by Churchill Engineering.

2009 construction cost estimates:	**$59,500**
Estimate of construction costs for **2017-2018**:	**$118,000**
Estimate of planning/permitting costs:	**$40,000**
Total estimated cost:	**$158,000**

Sincerely,

Drew McManus
Conservation Agent/Herring Warden
Town of Mashpee
508-539-1400 X8539
amcmanus@mashpeema.gov

COASTAL PROCESSES SPECIALIST
WOODS HOLE SEA GRANT | CAPE COD COOPERATIVE EXTENSION
gberman@whoi.edu | gberman@barnstablecounty.org
508-289-3046 | 193 Oyster Pond Road, MS #2, Woods Hole, MA 02543-1525

April 24, 2017

TO: Andrew McManus (Conservation Agent, Town of Mashpee)

CC:

FROM: Greg Berman, Coastal Processes Specialist (WHSG & CCCE)

RE: Site visit to John's Pond Fish Ladder on 04/10/2017

Background: Since the inception of the coastal processes position established within WHSG & CCCE, on-site and remote technical assistance on coastal processes has been and continues to be an on-going, effective technical information communication and dissemination tool. Technical assistance relating to coastal processes, shoreline change, erosion control alternatives, coastal landform delineation, potential effects of various human activities on coastal landforms, coastal floodplains, coastal hazards and hazard mitigation analyses, and dune restoration techniques provided in the field and remotely will continue to be provided on an as-needed basis. Site visits generally address site-specific coastal processes or coastal hazards related issues. Follow-up unbiased, written technical analyses are generally provided.

Setting: John's Pond is a relatively large (317 acres) kettle pond located in Mashpee (Figure 1). This is an inland pond, approximately 5 miles north of Nantucket Sound, however anadromous fish still make use of this area, making a fish ladder (Aerial 1) at the north end of the pond necessary. Recently there has been an issue with sedimentation at the fish ladder, requiring the use of heavy machinery to dig out areas near the fish ladder to make it viable again. The Conservation Agent for Town of Mashpee requested the Coastal Processes Specialist examine the area surrounding the fish ladder on John's Pond to determine where sediment may be entering the ladder and how it might be mitigated. A site visit was performed on 04/10/2017. The following section is broken up into 4 separate areas where sediment may be entering the fish ladder and interfering with proper fish passage. The 4 areas match with the red numbers on a provided figure (Aerial 1-zoom) and also refer to the corresponding numbered photographs (Photographs 1-4) taken during the site visit.

Area 1: Photograph 1 was taken on the west side of the inlet looking towards the jetty which is in disarray. The area west of the inlet has a sandy beach that extends laterally to the public beach and offshore only a short (<5') distance before a cobble bottom becomes prevelant. There is a slight impoundment at the western jetty, which indicates that there is some sand migrating in this direction. There is a gap in the jetty right at the water/beach interface and sand has an easy path directly into the inlet.

- Potential Mitigation: The volume of sand from this area is likely of **MEDIUM** impact to the overall sedimentation issue at the fish ladder. By tightening the jetty it is likely that more sand will be impounded instead of allowed to pass through into the inlet. Care should be taken that if impounded sediment reaches the height or offshore length of the jetty, then the sand may need to be bypassed around the inlet or backpassed to the public beach area.

Area 2: Photograph 2 was taken looking at the east side of the inlet this jetty is also in disarray and the landform is eroding. This side of the inlet is cobble and it is unlikely that sand would be entering the inlet from this direction. If any sand is entering the inlet, it is due to the erosion of the sandy landform.

- Potential Mitigation: The volume of sand from this area is likely of **LOW** impact to the overall sedimentation issue at the fish ladder. The jetty could be tightened, but it is not the major concern as there is not much sand moving along the shoreline. Stabilization of the landform, by way of fiber rolls, biodegradable blankets, along with planting native vegetation suitable for stabilizing the environment would likely take care of any sediment input from this area. Foot traffic would need to be prevented (i.e. fencing/signs) during the stage when vegetation is getting established, and perhaps even longer.

Area 3: Photograph 3 was taken north of the fish ladder looking at an eroding bank. The trees in the image will likely not survive in their current exposed state, and will likely pull even more of the bank down into the stream when they fall. Right now sandy soils are actively entering the stream channel. Footprints are apparent in the photograph.

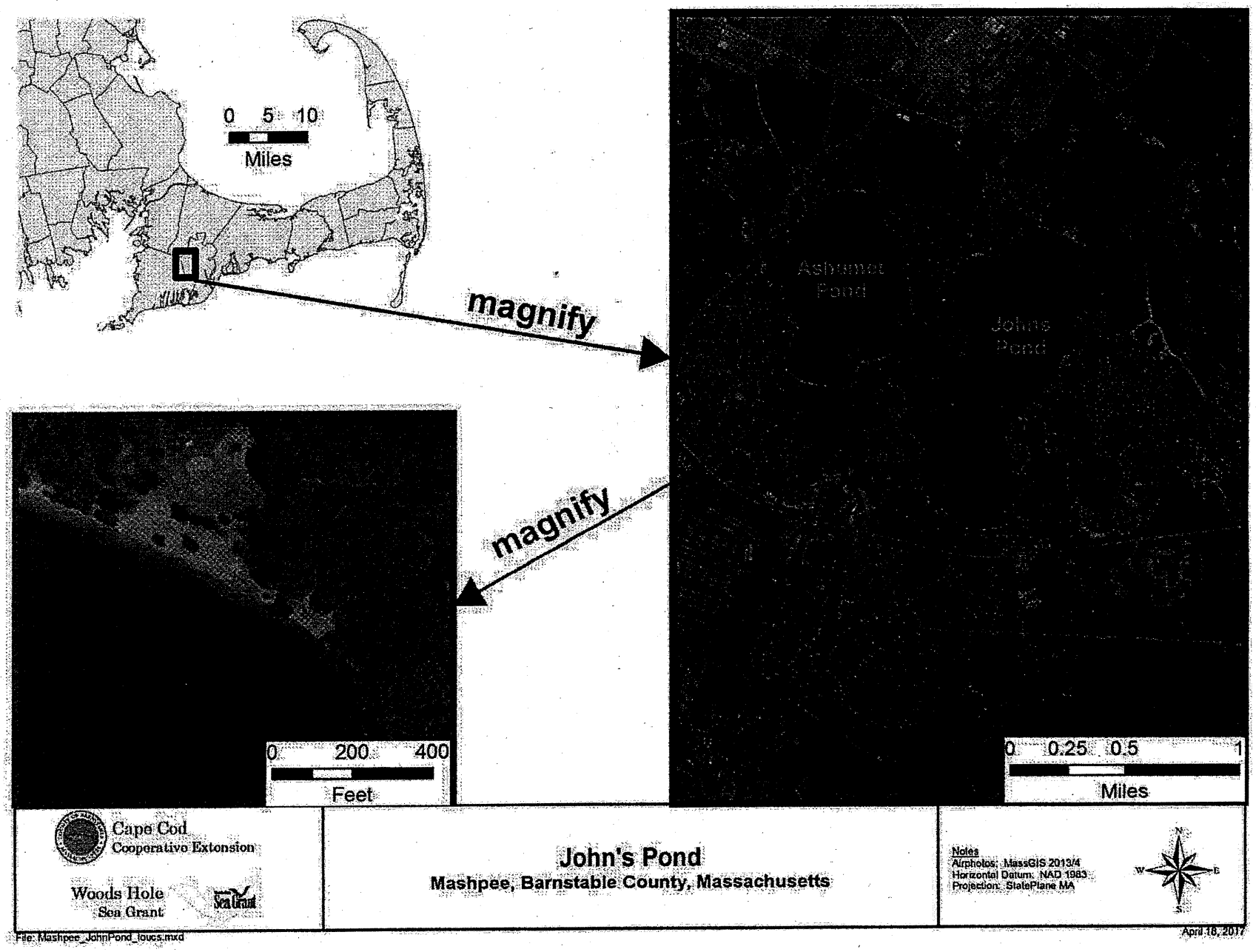
- Potential Mitigation: The volume of sand from this area is likely of **MEDIUM** impact to the overall sedimentation issue at the fish ladder. The trees would need to be removed, or at least flush-cut to the bank to prevent further destabilization. Regrading the bank to a more gentle angle may be necessary. Stabilization of the landform, by way of fiber rolls, biodegradable blankets, along with planting native vegetation suitable for stabilizing the environment would likely take care of any sediment input from this area. Foot traffic would need to be prevented (i.e. fencing/signs) during the stage when vegetation is getting established, and perhaps even longer.

Area 4: Photograph 4 was taken on the east side of the inlet looking towards the west side jetty which is slumping. This jetty is lower than the adjacent sandy ground surface and sediment is actively leaking over the jetty into the inlet. Additionally there is no significant amount of live vegetation along the jetty to prevent storm runoff, or even waves from the pond side causing sand to pour over the low jetty and into the fish ladder inlet.

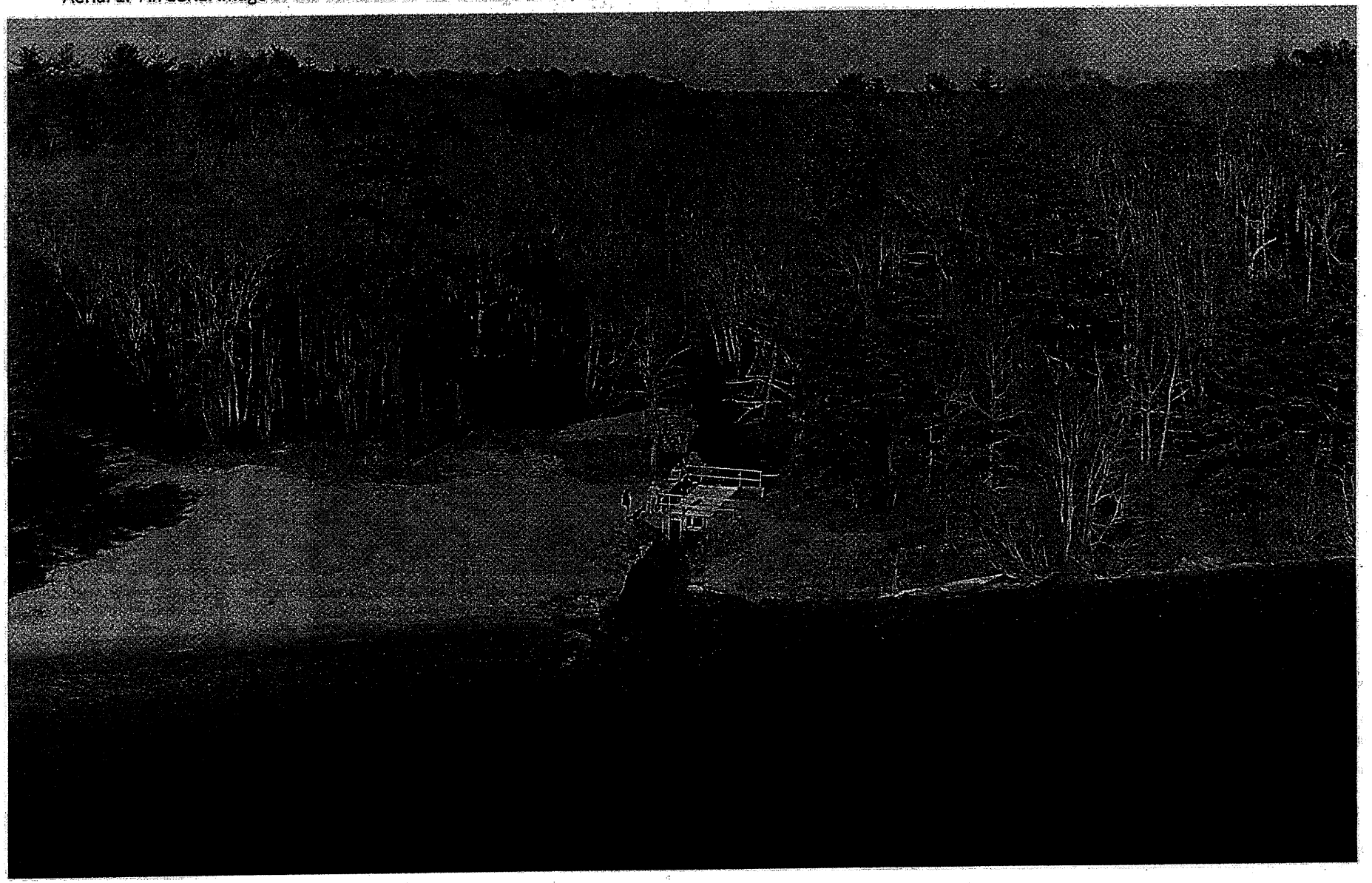
- Potential Mitigation: The volume of sand from this area is likely of **HIGH** impact to the overall sedimentation issue at the fish ladder. The jetty could be raised to the height of the fish ladder and allowed to taper towards the pond, always staying well above the ground surface. Vegetation might help, but would not be entirely needed with a more robust jetty. Other options discussed included removing the jetty and replacing it with a softer alternative (ex. fiber rolls, coir envelopes, etc.). These would all need a very gentle angle away from the inlet with native vegetation completely covering an area 10-30' away from the jetty. Foot traffic would need to be prevented (i.e. fencing/signs) perhaps in perpetuity. As this appears to be an area that is heavily trafficked (and perhaps a valuable recreation spot) the higher jetty would allow for more public access to this area.

Offshore Pond: An additional area that might be contributing sediment to the fish ladder is the pond itself. This area was not included above as it is likely not a significant contributor to the fish ladder. Looking offshore the pond (Aerial 1) it is apparent that there is a significant amount of submerged aquatic vegetation approximately 20-30' away from the shoreline. Also there are no apparent areas of sand waves/ripples that might indicate sediment movement (except immediately offshore of the jettied inlet, which is to be expected). These indicators show that there is likely not a significant amount of sediment moving from the pond into the fish ladder.

Figure 1. Overview map illustrating the location of Johns Pond in relation to Mashpee, MA.

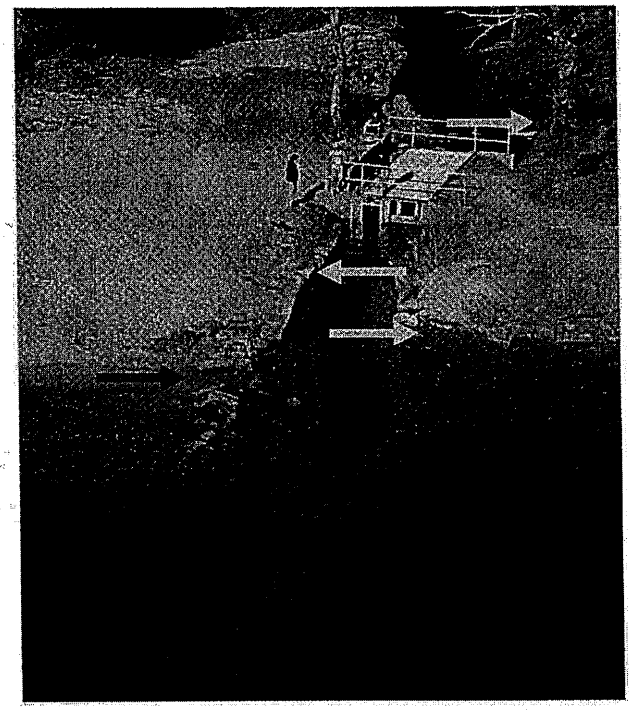


Aerial 1. An aerial image of the entrance to the fish ladder from John's Pond.

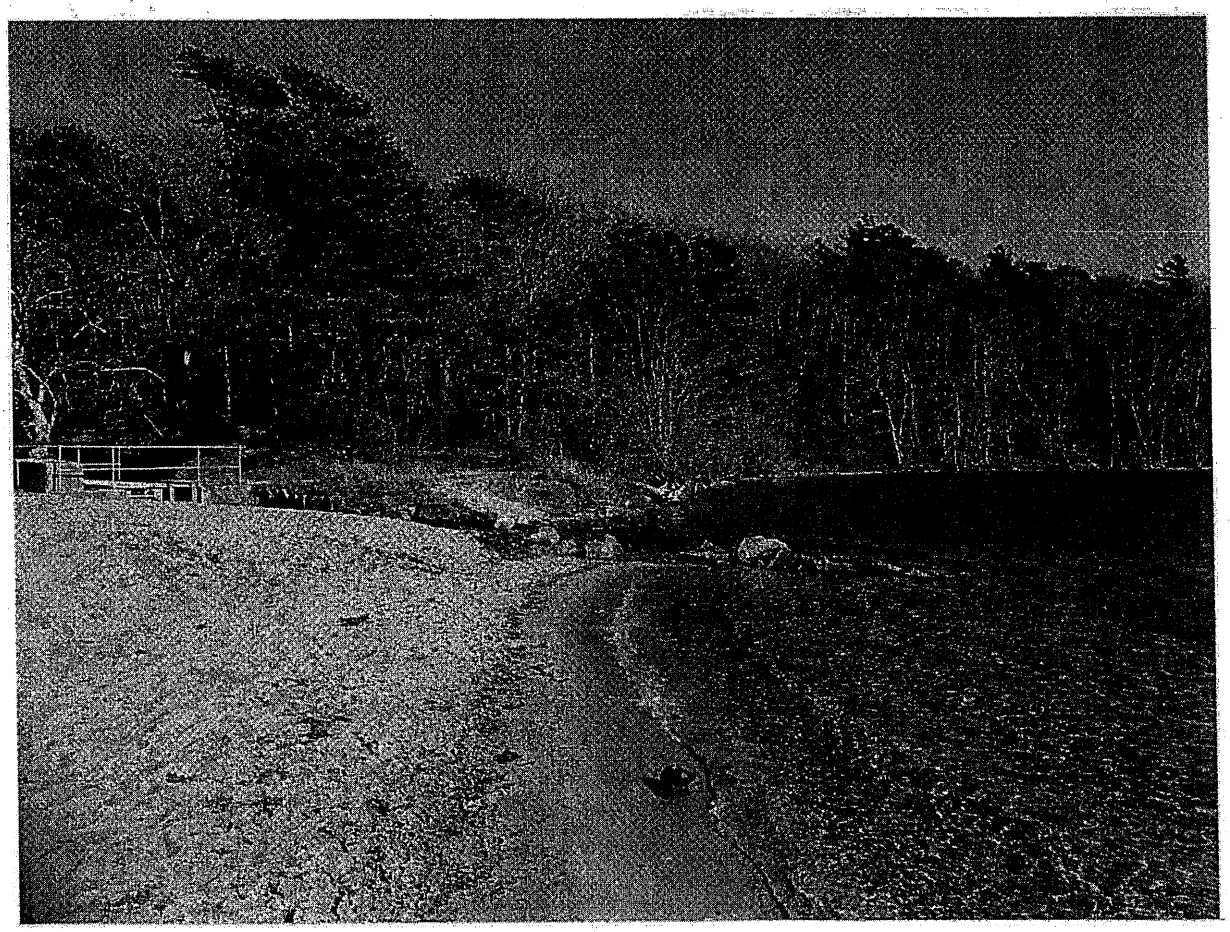


Aerial 1-zoom. A close up image of the previous aerial photograph. The red numbers indicate separate areas of sediment movement, that are referenced in the report text and also refer to the corresponding photograph numbers.

The red arrow on the image to the right indicates the location and direction of the photograph at the bottom of this page in red, and the other photographs in the series are yellow.

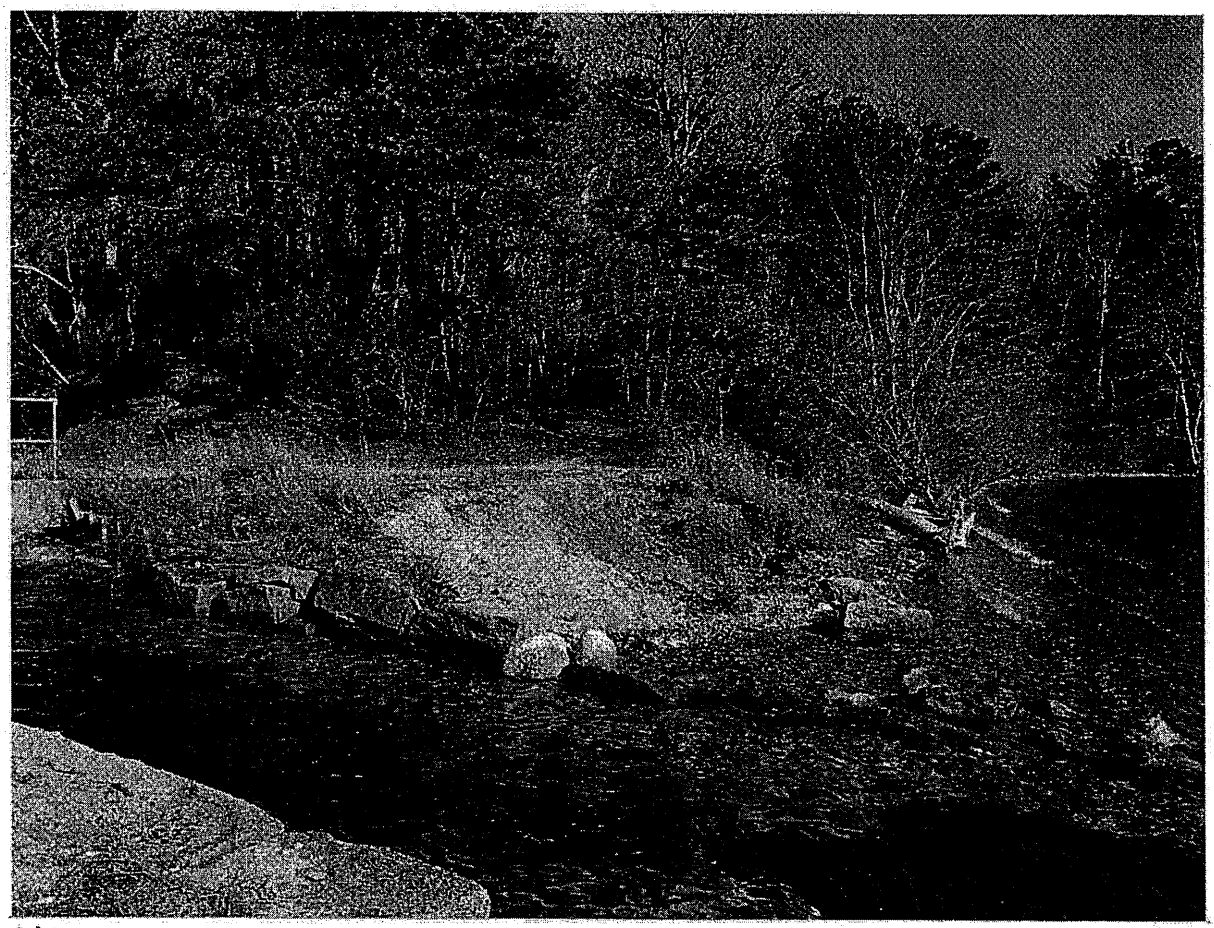


Photograph 1. Taken on the west side of the inlet looking towards the jetty which is in disarray. This side of the inlet is sandy and sediment may be leaking through the jetty into the inlet.

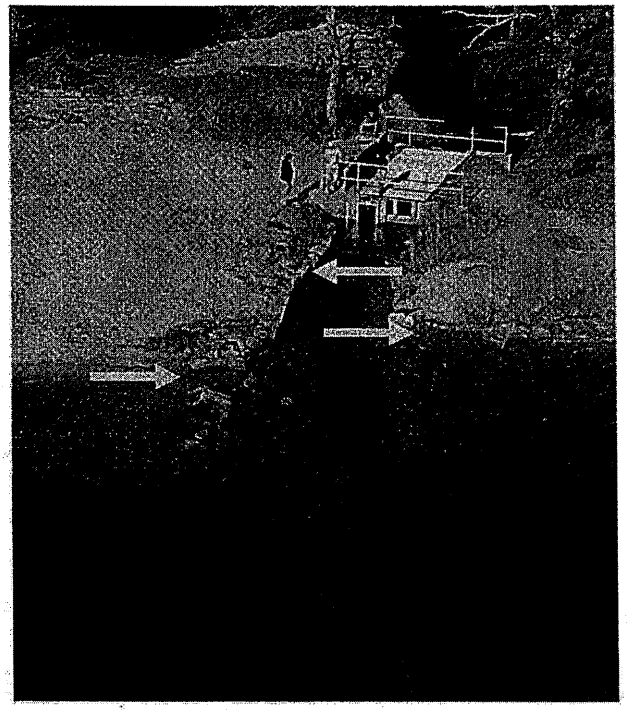


The red arrow on the image to the right indicates the location and direction of the photograph at the bottom of this page in red, and the other photographs in the series are yellow.

Photograph 2. Looking at the east side of the inlet this jetty is in disarray and the landform is eroding. This side of the inlet is cobble and it is unlikely that sediment would be entering the inlet from this direction.



The red arrow on the image to the right indicates the location and direction of the photograph at the bottom of this page in red, and the other photographs in the series are yellow.



Photograph 3. Taken north of the fish ladder looking at an eroding bank. These trees will likely not survive in their current exposed state. Sandy soils are entering the stream channel.

The red arrow on the image to the right indicates the location and direction of the photograph at the bottom of this page in red, and the other photographs in the series are yellow.

Photograph 4. Taken on the east side of the inlet looking towards the west side jetty which is in disarray. This jetty is lower than the adjacent sandy ground surface and sediment is actively leaking over the jetty into the inlet.